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several and corresponding distances apart, in the two bones when compared.

Thus it will be seen that the subfossil bones of birds in this collection from the several Bone Caves of Tennessee (so far as I have been able to identify them with certainty), belonged only to species still abundantly found in our avifauna, or were found there. Of the species enumerated below, it may be said that the Wild Turkey and the Passenger Pigeon are on the high road toward total extinction.

Colymbus auritus.

Colinus virginianus.

Bonasa umbellus.

Meleagris gallopava.

Ectopistes migratorius.

Megascops asio.

Ceophlœus pileatus.

To these may be added a doubtful Duck and a Grouse, while still other bones represent species that cannot be satisfactorily identified until the skeletons are made more complete by the discovery of additional material.—R. W. SHUFELDT.

PROCEEDINGS OF SCIENTIFIC SOCIETIES.

Torrey Botanical Club.—Wednesday evening, March 31, 1897.
—The first paper, by Dr. Albert Schneider, "The Phenomena of Symbiosis," and a paper by Leonard Barron on "Horticulture in Botanical Gardens," were read by title.

The evening was occupied by a paper by Prof. Edward S. Burgess on "*Aster macrophyllus* and its Allies," illustrated by chart of relationship and by numerous specimens. The speaker sketched briefly the history of the species *Aster macrophyllus*, in which it has been the custom of American botanists to include all large leaved *Asters*. He showed how diverse these *Asters* are, and in what confusion their assignment to a single species results, and indicated the characters according to which they form two groups each of several species and varieties.

The paper which will soon appear in print, was discussed by Mr. E. P. Bicknell, who confirmed the distinctions offered by the results of his observations about New York, and by Dr. Britton, who paid a tribute to the masterly manner in which Dr. Gray had treated the subject of the genus *Aster* so far as material was then available, and who referred to the special need for extended field work and further collaboration which this genus had long presented.

Tuesday evening, April 13th.—Dr. Albert Schneider presented a paper entitled “Methods Employed in the Examination of Powdered Drugs and their Adulterants.”

He described certain microscopic structural features which he had investigated with a view to find characters by which to distinguish the more important drugs, giving details of such characteristics determined by him for mace, senna, leaves of *Eucalyptus* globules, etc.

Dr. Britton spoke of the utility of this work and of its objects in behalf of the new edition of the U. S. Pharmacopeia.

Wednesday evening, April 28, 1897.—In the absence of officers, Professor Underwood was elected Chairman of the meeting and Professor Britton Secretary pro tem. There were 26 persons present.

The Chairman announced to the Club the recent death of Dr. Emily L. Gregory, Professor of Botany in Barnard College, and remarked on her life and works. Dr. H. M. Richards, Dr. H. H. Rusby and Miss Alexandrina Taylor were appointed a committee to draw suitable resolutions and report them to the Club at a subsequent meeting.

The scientific program comprised the following papers:

1. By Professor L. M. Underwood: “Notes on the Ferns of Japan.” (Abstract).

The immediate occasion of this paper was the receipt during the past year of two separate collections of Japanese ferns of about 50 species each, which, being from different portions of the island, scarcely duplicated each other. Some of the more interesting were shown, including *Camptosorus sibiricus*, *Cystopteris japonica* and *Struthiopteris orientalis*.

The insular position of Japan together with a considerable range of latitude, equalling that from St. Paul, Minn., to Mobile, Ala., gives Japan a larger proportion of ferns than we have in the United States, although the area of the islands is only that of the northeastern States as far as the Virginias together with about one-half of Ohio.

The ferns are those of temperate climates and agree well with those of the adjacent mainland so far as the latter are known. A few sub-tropical forms enter the flora, but the really tropical species do not reach the islands.

Many species are common inhabitants of Europe as well as the eastern United States, but the ferns of Japan offer very little support to the once prevalent notion of the great similarity to the flora of the eastern United States. In fact about as many Japanese species have as many near allies in Pacific America as in other portions of the country if we exclude the species quite generally distributed through the North Temperate Zone.

Discussing the paper, Professor Britton cited a number of instances among spermatophytes, in which species supposed to be common to Japan and eastern North America, has been shown to be distinct. He maintained that the theory of migration, as ordinarily accepted, was insufficient to account for such similarity between the floras of the two regions as actually exists. Mr. T. H. Kearney, Jr., remarked that in comparing the grass-flora of the two regions, he had found that exclusive of circumboreal species, only two species are in common.

The second paper was by P. A. Rydberg, entitled "Floral Features of Western Nebraska."

It is a popular misconception that the country from Illinois to the Rocky Mountains constitutes one undifferentiated region. In fact, there are two entirely different regions, viz.:

1. The Prairie Region, with rich loam and a comparatively good supply of rain, extending to the Eastern Dakotas, Nebraska and Kansas.

2. The Region of the Great Plains, with dry, hard soil and scanty rain-fall, comprising the western portion of said States, eastern Colorado and Montana and the lower portion of Wyoming. In Nebraska the prairie region includes the eastern and south central portion of the State. The north central portion constitutes a region unique to Nebraska, the Sand-Hill Region, spoken of in one of the February meetings of the Club. Mr. Rydberg corrected a statement made by him then, viz., that he had seen "blow outs" in that region 300 feet deep. He had intended to say 300 feet in diameter and 60 to 70 feet deep.

The western portion of the State is made up of high plains, except a small portion of the northwestern corner containing the "Pine Ridge" and the "Bad Lands" of White River and Hat Creek. The plains have very few rivers, and the drainage is mostly by means of "sand-draws." Seen from a hill a sand-draw resembles a well beaten and winding sandy road. It is a stream with no visible water. The water is running from one to fifteen feet below the surface. Even the larger streams as the Lodge Pole and South Platte sometimes sink down in the sand.

The plains are mostly covered by short grasses, the so-called Buffalo grasses. In the hot, dry autumn, these become self-cured, and form an excellent winter pasture for the stock. A little hay is cut on the lowlands and fed to the animals during snow-storms. Otherwise the cattle and horses feed out during the whole winter. The Buffalo grasses are: the original Buffalo grass *Bulbils dactyloides*, Blue and Black

grama *Bouteloua oligostachya* and *hirsuta*, and "Nigger Heads," *Carex filifolia*.

In a region where the rain-fall is comparatively scant and distributed only during certain seasons of the year, the plants must be so constituted as to be able to withstand a good deal of drought. In other words, the evaporation must either be reduced to a minimum or the plant must have special stores of water. The plants peculiar to this region may be divided in the following groups:

1. Very hairy plants generally covered by thick pannose pubescence, which retain the moisture, as species of *Eriogonum*, *Astragalus*, *Eurotis*, *Senecio*, *Evolvulus* and *Artemisia*.

2. Plants with glaucous foliage having a hard epidermis, as *Yucca glauca*, *Rumex venosus*, *Argemone alba*, and several grasses.

3. Plants with white, often shreddy bark, as species of *Mentzelia* and *Anogona*.

4. Plants with very narrow and often involute leaves, as *Lygodesmia juncea* and *rostrata* and several grasses and sedges.

5. Plants with fleshy stems in which the surface is reduced to a minimum and no leaves, as the *Cacti*.

6. Plants with a deep-seated, enlarged root, as the Bush Morning-glory *Ipomœa leptophylla*, and the Wild Pumpkin *Cucurbita foetidissima*. Mr. Rydberg had seen a root of the former 3 feet long and almost 2 feet in diameter.

7. Plants covered with glands, containing essential oils, as *Dysodia papposa* and *Pectis angustifolia*. The oil is supposed by some to have a cooling effect, partly by taking up heat when evaporated and partly by surrounding the plant by a cooler atmosphere, their specific heat being much less than the air.

Numerous specimens were exhibited.

Three papers followed by Dr. J. K. Small, "(a) The Sessile-flowered *Trillia* of the Southern States," (b) "Notes on Epilobiaceæ." Both papers are published in the April issue of the *Bulletin*.

Dr. Britton exhibited a specimen of *Silene conica* L., collected by Mr. A. D. Selby at Clyde, Ohio. This species is a recent immigrant from Europe.

N. L. BRITTON, *Secretary, pro tem.*

New York Academy of Sciences.—Biological Section.—April 5, 1897.—The Chairman, Prof. E. B. Wilson, in the chair. Twenty-two persons present. Prof. Osborn moved that a committee be appointed to consider and take action on the question of postage on

Natural History specimens. The Chair appointed Doctors Dyar and Dean and Prof. Stratford.

Professor Bristol offered his resignation as Secretary. It was accepted, and the election of his successor was laid over until the next meeting.

Prof. Osborn reported upon the phylogeny of the early Eocene Titanotheres, showing that they are divided into two distinct series included under the genera *Telmatotherium* and *Palæosyops*, both of which independently acquired horns. The *Telmatothere* line begins with *T. boreale*, a form which Cope referred to as *Palæosyops*. It is distinguished by animals with long narrow skulls and high stilted feet, and undoubtedly represented the upland types of the family. The *Palæosyops* line, as suggested by Earle and Hatcher, passes through *P. laticeps* and *P. manteoceras* and leads up to *Dipladodon*, the larger species of which surpass in size the smaller Titanotheres of the Oligocene. This main line gives off several collaterals, such as *P. paludosus*. *Lambdotherium* does not belong in the *Titanotheres* phylum at all.

A second note related to a division of the two groups of placental mammals, the *Mesotheria* and *Cenotheria*. The former, since Wortman's demonstration that the *Ganodonta* are ancestral edentates, must now embrace this division, besides the *Creodonta*, *Lemuroidea*, *Tillo-dontia*, *Insectivora*, *Amblypoda* and *Condylarthra*.

The third note related to the origin of the typical mammalian types of teeth among the *Theriodonta*, *Cynodontia* and *Gomphodontia* of the Triassic. It is especially noteworthy that the *Gomphodontia* afford a demonstration of the origin of *Multituberculate* teeth from a *trituberculate* ground plan, as hypothetically assumed by the speaker some years ago.

Mr. Bradley B. Griffin reported that in *Thalassema* (one of the *Echiurids*) the spireme occurs in minute ova (3 micra in diameter) floating clusters in the body cavity. The spireme segments into one-half the somatic number of chromosomes, which by partial longitudinal splitting pass into flattened ellipses. These elongate, and during the growth period become twisted and distorted, and their true shape thereby obscured. While entering the first polar spindle they appear as loose open rings or compact rods (bivalent). These by concentration and looping-up form crosses, opposite arms of which are attached to the "Zugfasern." During metaphase the crosses become drawn out into flattened ellipses which split across into two V's with closely apposed limbs. At telophase the latter separate at the angle and diverge in the second polar mitosis. No longitudinal splitting of the V's occurs.

In Zirhæa (Lamellibranch) the process is identical, although more obvious by reason of the less close apposition of the halves of the rings and V's. The conclusion is that in both forms a reducing division takes place. .

Mr. J. H. McGregor offered a preliminary report on the development of the Spermatozoa in Amphiuma.

Prof. F. E. Lloyd's paper on Pholadidæa of the Pacific Coast was read by title.

May 3, 1897.—The Chairman, Professor E. B. Wilson, in the chair. Fifteen persons present. Mr. Gary N. Calkins, of Columbia University, was elected Secretary.

In the absence of Dr. Dyar, Chairman of the Committee appointed to consider the question of postage on Natural History specimens, Professor Stratford reported that the Postmaster General had been notified, and that the matter had received due consideration.

Upon behalf of the Committee appointed to draw up a resolution relating to the death of Professor Cope, Professor Osborn delivered a brief eulogy of the great naturalist, pointing out the especial features which have made his work famous and have given him such a high position in the history of Natural Science. He dwelt especially upon the fact that Professor Cope prosecuted five great lines of work simultaneously, and that in each he acquired a commanding position. He also spoke of some of his generous qualities as a fellow scientific worker, especially his liberality in the loan of collections and generous recognition of the work of others. Finally, he alluded to his remarkable independence and fortitude of character, and persistent devotion to science, even with limited resources. His death leaves a vacuum especially in the line of able and accurate criticism of contemporary work. Professor Osborn concluded by submitting the following resolution :

The members of the New York Academy of Sciences desire to record their admiration of the noble services to Science of the late Professor Edward D. Cope. Since 1859, when he offered his first contribution to the Philadelphia Academy of Sciences, at the age of nineteen, he has been a devoted and brilliant investigator in five great branches of Natural History, ichthyology, herpetology of the batrachians and reptiles, mammalian palæontology, historical geology and philosophy. In each he has long been an acknowledged leader, and his combined knowledge of all has given his researches a philosophical breadth, grasp and permanence, which place him among the great masters of Comparative Anatomy, Cuvier, Owen and Huxley. We deeply regret that his untimely death has cut short his life work, and feel that the loss of his

keen critical and productive faculty deals a blow to the cause of comparative anatomy of the vertebrata throughout the world which can hardly be measured. We tender to the American Philosophical Society and to the Academy of Natural Sciences of Philadelphia, of which Professor Cope was a life long member, an expression of our deep regret at their loss, and of our readiness to coöperate with them in the establishment of some suitable memorial.

Signed { HENRY F. OSBORN.
J. L. WORTMAN.

Mr. H. E. Crampton, Jr. gave a brief abstract of a paper by F. C. Baker on "Notes on Variations in the Apex of Gasteropod Molluscs."

Professor Bashford Dean and Mr. F. P. Summer reported on the spawning habits of *Petromyzon wilderi* at Van Cortlandt Pond.

Mr. H. E. Crampton, Jr. reported on some Coalescence-Experiments with Lepidoptera.

A paper on the "Vertical Distribution of Plankton in Deep-Sea Collections from Puget Sound" by Prof. James I. Peck and Mr. N. R. Harrington was read by title.—GARY N. CALKINS, *Secretary*.

The Academy of Science of St. Louis.—At the meeting of the Academy of Science of St. Louis on the 7th of June, 1897, twenty-one persons present, Mr. Robert Combs, of Ames, Iowa, presented a paper entitled Plants Collected in the District of Cienfuegos, Province of Santa Clara, in 1895–1896. The paper embraces the results of a collection extending from the commencement of the rainy season of one year until the close of the dry season the following spring, the territory covered by the collection lying between the entrance of the Bay of Cienfuegos, on the south coast of Cuba, up the bay and the river Danuji to Rodas, and extending back from the river to Yaguaramos and almost to the Cienega de Zapato, a region including nearly all kinds of soil and condition found upon the island, except those of the mountain regions and the mud swamps. A brief statement was made concerning the origin of the Cuban flora and its affinities with that of continental Central America, rather than the geographically nearer Floridan region.

The paper comprised a full catalogue of the collections made, which had been determined at the herbarium of Harvard University, and of which several sets had been distributed to the larger herbaria.

Professor F. E. Nipher made some remarks on the difficulties yet involved in the theories of the ether.

WILLIAM TRELEASE, *Recording Secretary*.